

Q1. (June 2018)

C

Q2. (June 2018)

B

Q3. (June 2018)

16	(a)	four / 4 ✓	1	1.2	
	(b)	badger number have increased ✓ more competition for food / less slugs to eat ✓	2	3.1b 3.2b	IGNORE reference to hedgehog numbers dropping ALLOW badgers eat more slugs so less for hedgehogs ALLOW less food to eat IGNORE badgers are predators of hedgehogs IGNORE they both eat slugs
	(c)	(i) in country/advantage/where badgers live, if it rolls up in a ball then will provide more protection / less attacks from badgers/predators ✓ in cities/disadvantage/many roads, it will be run over by cars ✓	2	2 x 2.1	ALLOW in country/advantage/where badgers live hedgehogs have defence against predators/badgers ALLOW hedgehogs have a reduced risk of being eaten
		(ii) hedgehogs that run away are more likely to survive / less likely to get run over ✓ they will reproduce ✓ pass on the allele/gene for running away ✓ over time/many generations (running away will become more common) ✓	4	4 x 2.1	ALLOW ORA for each marking point ALLOW reference to how change occurred e.g. mutation for running away ALLOW offspring produced / breed together ALLOW pass on advantageous gene IGNORE trait is pass on / genes are passed on

Q4. (June 2018)

17	(a)	correctly chosen axes, labelled with units ✓ suitable scale on both axes ✓ all points correctly plotted ✓✓ line of best fit through most points ✓	5	5 x 2.2	place ticks on right hand side of grid minimum 50% of grid used scale must be in ascending order ALLOW +/- half a square 0 to 5 correct points plotted = 0 mark 6 or 7 correct points plotted = 1 mark All 8 correct points plotted = 2 marks DO NOT ALLOW dot to dot line ALLOW line of best fit for their plotting IGNORE any extrapolation of line ORA for all marking points
	(b)	idea of less plants/percentage of plants/% cover in shade/closer to the tree ✓ less light (in shade/closer to the tree)✓ less photosynthesis (in shade/closer to the tree)✓ less food/raw materials produced for growth (in shade/closer to the tree)✓	4	1.2 2.1 3.1b 3.2b	ALLOW shows negative correlation IGNORE less sun IGNORE in shade no photosynthesis / no light ALLOW less light for photosynthesis (closer to the tree) 2 marks ALLOW photosynthesis less effective (closer to the tree)

Q5. (June 2018)

20	(a)	<p>< 3(mm) ✓</p> <p>encourages more microbes from day 0 to 25 ✓</p> <p>therefore, more rapid decay/decomposition ✓</p> <p>OR</p> <p>3 – 5(mm) ✓</p> <p>encourages more microbes from day 26 to 50/overall ✓</p> <p>therefore, more rapid decay/decomposition ✓</p>	3	<p>3.1a</p> <p>3.2b</p> <p>3.2b</p>	<p>ALLOW > 5 given only 1 mark available for more rapid decay</p>
	(b)	<p>Any two from:</p> <p>(small pieces means) there will be a larger surface area of dead plants ✓</p> <p>therefore, decomposers will be able to reproduce faster / feed faster ✓</p> <p>therefore, decomposers will be able to respire faster ✓</p>	2	2 x 2.2	
	(c)	<p>idea of recycling in nature ✓</p> <p>named example of a recycled substance e.g. carbon/nitrogen ✓</p> <p>example of reason why the recycling is important e.g. for photosynthesis / production of proteins in plants ✓</p>	3	3 x 1.1	<p>ALLOW mineral being returned to the soil / environment</p> <p>IGNORE nutrients/minerals</p> <p>IGNORE water</p> <p>ALLOW carbon dioxide/nitrates/nitrogen compounds recycled</p>

Q6. (June 2019)

B

Q7. (June 2019)

B

Q8. (June 2019)

D

Q9. (June 2019)

16	(a)	(i)	feeds on seeds it is a primary (consumer) ✓ feeds on insects, then it is a secondary (consumer) ✓	2	2.1	ALLOW eats seeds which are the producer/first trophic level ALLOW eats insects which are the primary consumer ALLOW it feeds on seeds and insects if no other marks scored. IGNORE references to herbivores/carnivores/predators
		(ii)	predator because it eats/kills pine martens ✓ competitor (with pine martens) because they eat flycatchers/same prey ✓	2	2.1	ALLOW pine martens are foxes prey ALLOW foxes hunt pine martens ALLOW competitor because pine martens also eat flycatchers
		(iii)	insect(s) / Great tits	1	1.1	
	(b)	(i)	correctly chosen axes, labelled with units ✓ suitable scale for the number of bird boxes ✓ bars correctly drawn ✓ suitable key ✓	4	2.2	height (m) must be on x-axis DO NOT ALLOW scale that use less than half the grid ALLOW +/- half a square IGNORE –touching adjacent bars
	(ii)	Any three from: great tits (nest) higher (in the trees) / ORA ✓ this protects them from weasels who live mainly on the ground / ORA ✓ idea flycatchers (nest) at all heights ✓ as pine martens can move up and down/climb the tree ✓		3	3.2b	ALLOW weasels can't reach them/great tits ALLOW fewer great tits lower down as weasels eat them = 2 ALLOW flycatchers can get killed anywhere in tree by pine marten IGNORE pine martens eat flycatchers and live in the trees

17	(a)		2	1.1	ALLOW numbers matched to correct boxes All 4 lines correct = 2 marks 2 or 3 lines correct = 1 mark 1 or 0 lines correct = 0 mark
	(b) (i)	(no) microorganisms (in the soil) ✓ no decay (takes place) ✓	2	1.1 2.1	AW microbes, decomposers, saprophytes, detritivores, bacteria, fungi AW decomposition, rotting, break down ALLOW not enough nitrifying bacteria to replace nitrates / no nitrates released by nitrifying bacteria = 2 IGNORE no organisms to recycle the minerals
	(ii)	plants release oxygen by photosynthesis ✓ organisms in the soil / microbes / animals release carbon dioxide by respiration ✓	2	2.2	ALLOW correct word (or symbol) equations for photosynthesis linked to plants and respiration linked to organisms in the soil / microbes / animals AW microbes, decomposers, saprophytes IGNORE breathe out carbon dioxide IGNORE plants will respire and give out carbon dioxide ALLOW 1 mark for plants release oxygen/photosynthesis and microbes give out carbon dioxide/respire if no other marks are awarded.

Q11. (June 2019)

22	(a)	(the salt) will draw water out of the plant cells by <u>osmosis</u> ✓	1	2.1	ALLOW plant cells will lose water and become plasmolysed IGNORE flaccid / dries the plant out
	(b) (i)	FIRST CHECK ANSWER ON THE ANSWER LINE If answer = 0.1 (%) award 3 marks = 2.5 ✓ $\frac{2.5}{2500} \times 100$ ✓ = 0.1 (%) ✓	3	1.2 2.2	ALLOW ECF on area of quadrats ALLOW ECF
	(ii)	Any three from: the second student samples less area / ORA ✓ the second student did not sample at random / only sampled in the centre of the marsh / ORA ✓ the centre may contain different plants compared to the edges ✓ so, idea that the second student's results may be less representative / less accurate / ORA ✓	3	3.1b	ASSUME SECOND SAMPLE IF NOT STATED ALLOW only 5 quadrats taken / less repeats / less sample size / less data collected ALLOW the second student will not have results from all over the marsh / ORA
	(iii)	make sure the tide is not coming in / make sure that the marsh is stable enough / wash hands after the experiment ✓	1	3.3b	ALLOW be aware of tide timetables/high tides ALLOW be safe as the tide is unpredictable ALLOW avoid falling into deeper marsh/slipping in mud IGNORE references to clothing
	(c)	salt marshes are rare habitats ✓ they contain plants that do not live anywhere else ✓	2	3.2b	ALLOW salt marsh plants are rare ALLOW plants can be lost / extinct ALLOW loss of habitat for the animals that live there

Q12. (June 2022)

D

Q13. (June 2022)

C

Q14. (June 2022)

A

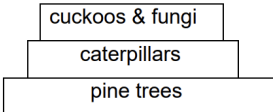
Q15. (June 2022)

16	(a)	<p>Any two from:</p> <p>Use a quadrat ✓</p> <p>Positioned at random / use of several (quadrats) ✓</p> <p>Count the number (of thistle in a quadrat) ✓</p> <p>AND</p> <p>Any one from:</p> <p>Idea of scaling up a smaller area of quadrat to the number in 1m² ✓</p> <p>Work out the mean (of the 1m² quadrat) ✓</p>	3	3 x 1.2	<p>DO NOT ALLOW transect line. Maximum 1 mark from this section.</p> <p>IGNORE quadrant</p> <p>ALLOW random number generator/use co-ordinates to generate positions</p> <p>IGNORE count the organisms/percentage cover</p> <p>ALLOW work out the average/divide number of thistle plants by number of quadrats</p>
	(b)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE</p> <p>If answer = 1.8 award 2 marks</p> <p>36/20 ✓</p> <p>OR</p> $\frac{36}{(1/2 \times 10 \times 4)} \quad \checkmark$ <p>1.8 ✓</p>	2	2 x 2.2	<p>ALLOW rounding to 2 for 2 marks</p>
	(c)		3		Assume answer refers to thistles after mowing
		<p>Will receive more light ✓</p> <p>Will be able to photosynthesise more/faster ✓</p> <p>Produce more sugars/glucose/raw material (for growth) ✓</p>		<p>2.1</p> <p>1.1</p> <p>2.1</p>	<p>ALLOW ORA for before mowing</p> <p>ALLOW less competition for light</p> <p>IGNORE less competition for space/water/minerals</p> <p>IGNORE sun</p> <p>ALLOW more sunlight for photosynthesis = 2 marks</p> <p>IGNORE respire faster</p> <p>IGNORE produce more food</p> <p>At least one marking point must be comparative to score any marks</p>

Q16. (June 2022)

17	(a)	To allow oxygen gas into the bottle ✓	1	1.2	
	(b)	(i) FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 16.3 award 3 marks 300-235 / 4 ✓ or 65/4 ✓ 16.25 ✓ = 16.3 ✓	3	2 x 2.2 1.2	ALLOW 16.2 without working for 1 mark ALLOW Clear evidence of correct conversion of incorrect answer to 3 significant figures
		(ii) Greater the number of (air) holes, the faster the rate (of decomposition) ✓ Idea that the relationship is not linear E.g. The rate of decomposition is not increasing at the same rate that the number of air holes are ✓	2	2 x 2.2	ALLOW ORA for less number of (air) holes IGNORE air flow IGNORE more air holes more mass lost ALLOW the relationship is not directly proportional
		(iii) (Easier) to compare (the amount of mass that had been lost) ✓	1	2.2	ALLOW no need to calculate the percentage change IGNORE to make it a fair test/is more accurate/is more reliable/is a control variable/fewer calculations
	(iv)	Number of (air) holes ✓	1	2.2	IGNORE air holes unqualified
	(v)	Idea that it/water would not have been weighed / the mass would have been lower ✓	2	2.2	ALLOW not all mass lost would have been due to decomposition IGNORE references to loss of plant waste reducing the mass IGNORE mass affected by loss of water
				3.3b	DO NOT ALLOW block up the drain holes
(Collect the water) and measure its mass / pour it back into the bottle ✓					ALLOW at the end of the experiment measure the plant wastes dry mass

Q17. (June 2022)

20	(a)	 <p>Three trophic levels correctly drawn ✓</p> <p>Correctly labelled ✓</p>	2	2 x 2.1	ALLOW birds for cuckoos ALLOW triangle
	(b)	A mutation occurs (so some cuckoos have a sticky membrane) ✓ (These cuckoos) can eat caterpillars ✓ (These cuckoos) will pass on the allele (for sticky membranes) ✓ Over many years/eventually all the cuckoos have sticky membranes/the allele ✓	4	4 x 2.1	IGNORE cuckoos get more food IGNORE gene IGNORE pass on the characteristic ALLOW over time, all cuckoos without sticky membranes die out ALLOW over time, allele frequency increases so all cuckoos have it
	(c)	(i) Biological ✓	1	1.1	
		(ii) 2 ✓	1	1.2	

(d)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 69.23 award 2 marks $9/13 \times 100 \checkmark$ $69.23 (\%) \checkmark$	2	1.2 2.2	ALLOW 69.2307692308 or any correct rounding e.g. 69/69.2
	(ii)	Any one from: Predators $\checkmark$ Parasites/other pathogens/diseases $\checkmark$ Weather conditions/change in temperature $\checkmark$ Lack of food $\checkmark$ More competition $\checkmark$	1	2.1	IGNORE the oil from the pine trees
	(iii)	Any two from: Ginger is more effective than rosemary (at killing larvae) / ORA $\checkmark$ Ginger/rosemary is more effective on the pine trees than in the lab / ORA $\checkmark$ Both are more effective than the control treatment $\checkmark$ AND Data used to back up argument $\checkmark$	3	3 x 3.1b	ALLOW AW throughout for more effective e.g. better Data mark can only be given if at least one correct evaluation mark awarded Data must involve some manipulation e.g. ginger kills 1586 and rosemary kills 1061 in total/ginger kills 525 more overall than rosemary e.g. ginger kills 412/41.2% more in the lab than rosemary e.g. ginger kills 113/11.3% more on the pine trees than rosemary e.g. ginger kills 16.2% more on the pine trees than in the lab

Q18. (June 2023)

A

Q19. (June 2023)

A

Q20. (June 2023)

B

Q21. (June 2023)

16	(a)	Bacteria / fungi ✓ Respiration ✓ (Re)cycled ✓	3	3 x 1.1	ALLOW saprophytes DO NOT ALLOW detritivores IGNORE aerobic/anaerobic ALLOW AW e.g., reused/reabsorbed/released/absorbed IGNORE conserved/stored
	(b) (i)	Microorganisms give off heat when they decompose waste ✓	1	1.2	DO NOT ALLOW more than 1 tick
	(ii)	The higher the nitrogen content compared to carbon, the faster the rate of decomposition ✓	1	3.2b	DO NOT ALLOW more than 1 tick
	(iii)	Any one from: External temperature ✓ Water ✓ Oxygen ✓	1	2.2	DO NOT ALLOW just temperature ALLOW room temperature ALLOW moisture/humidity/rain IGNORE time/soil
	(c)	Plant material: Horse manure ✓ Reason: Lower ratio of carbon to nitrogen / higher nitrogen content compared to carbon ✓ Fruit Waste: 40:1 Horse Manure: 30:1 Straw: 600:1 ✓	3	3.2a 3.1a 2.2	If horse manure is not selected only evidence of correct calculations for all plant material can be awarded ALLOW it has the most nitrogen ALLOW evidence of alternative correct calculations

Q22. (June 2023)

19	(a) (i)	Axes- even scales occupying more than half of the grid ✓ Plotting -all points correctly plotted ✓✓	3	3 x 2.2	0-2 points correctly plotted = 0 marks 3 points correctly plotted = 1 mark ALLOW +/- half a square
	(ii)	Line of best fit through most points ✓	1	2.2	DO NOT ALLOW dot to dot line ALLOW line of best fit their plotting IGNORE any extrapolation of line
	(b)	Allow idea they live longer than would be predicted by their mass ✓ (A rodent/mole rat) of 60g should live about 1.6 years ✓	2	2 x 3.2b	ALLOW rodents of their mass should not live so long AW size for mass ALLOW lifespan should be similar to gerbil of 1.5 years ALLOW age which matches line of best fit ALLOW range 1.5-1.7 years ALLOW live 16.5 years longer than they should

(c)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Gives a detailed explanation how each of the features allows the mole rats to survive in the tunnels.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Partially explains how the features allow the mole rats to survive in the tunnels.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Gives a limited explanation of how a feature allows the mole rats to survive in the tunnels.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks No response or no response worthy of credit</p>	6	3 x 1.1 3 x 2.1	<p>AO1.1 Demonstrates knowledge and understanding of scientific ideas to describe the features.</p> <ul style="list-style-type: none"> oxygen required for aerobic respiration haemoglobin in red blood cells transports oxygen to tissues lactic acid produced during anaerobic respiration <p>AO2.2 Applies knowledge and understanding to explain how the features allow the rats to survive.</p> <ul style="list-style-type: none"> (a low respiration rate) will reduce the need for oxygen (haemoglobin that binds oxygen more easily) will allow the oxygen to be picked up at the lungs from the low concentration in the air (haemoglobin that binds oxygen more easily) more oxygen will be carried to the tissues/cells less oxygen so anaerobic respiration is more likely increased production of lactic acid (lack of pain receptors) will prevent the lactic acid from causing pain and/or reducing movement
(d)	<p>(Slowing down the cell cycle) will slow down cell division/mitosis / less likely to divide uncontrollably</p> <p>OR</p> <p>Cancer is caused by rapidly dividing cells/mitosis ✓</p> <p>AND</p> <p>Prevent tumours ✓</p>	2	2 x 1.1	<p>AW cell replication/multiplication for cell division IGNORE reproduction IGNORE stops/prevents cell division/mitosis/cells dividing uncontrollably IGNORE any process slowing down that occur during interphase</p> <p>ALLOW cancer cells carry out uncontrolled cell division/multiply quickly IGNORE tumour cells</p> <p>IGNORE cancer growing IGNORE tumours spread slowly</p>

20	(a)	<p>Any two from:</p> <p>(More) competition ✓</p> <p>(Competition) for water/minerals/light/space ✓</p> <p>(Buddleia) produce large quantities of small seeds ✓</p>	2	2 x 2.1	
	(b)	<p>Any three from:</p> <p>(Capture butterflies using) nets ✓</p> <p>Capture some butterflies, mark, and release them ✓</p> <p>Capture some again and count how many are marked ✓</p> <p>Use formula/equation to (estimate the number) ✓</p>	3	3 x 1.2	<p>ALLOW credit for reference to a formula used</p> <p>Last three marking points can be awarded for a correct written formula</p> <p>Award 'capture – recapture' one mark if none of the last three MP are scored</p>
	(c)	<p>Community is the total number (of butterflies) in an area ✓</p> <p>Biodiversity takes into account how many different species (of butterflies) are present ✓</p>	2	2 x 1.1	<p>ALLOW large community means lots of butterflies</p> <p>ALLOW Butterflies may be of the same/few species which means low biodiversity</p> <p>If no worthy answer allow lots of butterflies but few/same species (of butterflies) for one mark</p>
(d)	(i)	<p>(Larger seeds) will not be spread by the wind ✓</p> <p>(New buddleia) less likely/will not spread to other habitats ✓</p>	2	2 x 3.1a	<p>ALLOW (larger seeds) mean less seed dispersal by wind</p> <p>ALLOW (larger seeds) will not be spread by other insects/butterflies</p> <p>IGNORE less seeds</p> <p>ALLOW ORA for smaller seeds</p> <p>ALLOW less/no colonisation</p> <p>IGNORE damage to habitats</p>
	(ii)	<p>(Uneven numbers of chromosomes will) prevent gametes being made (by meiosis) ✓</p> <p>Buddleia will slow down/not be able to produce seeds/reproduce ✓</p>	2	2 x 3.1a	<p>AW ovule and/or pollen for gametes</p> <p>ALLOW prevent haploid cells being made</p> <p>IGNORE prevents meiosis/replicate</p> <p>ALLOW slow down/stop fertilisation</p> <p>ALLOW number of seeds reduce</p>

Q24. (June 2023)

Subtopic: Ecosystems

<https://www.pcfgstudy.com/>

22	(a)	(i)	They were adding different volumes of run-off (to each jar) ✓ Keep the total/overall volume the same ✓	2	2 x 2.2	ALLOW to see effect/change the concentration/ratio of run-off water IGNORE effect of run-off on growth of duckweed IGNORE change concentration of pond water ALLOW so the total volume of run-off and clean pond water remains the same ALLOW to keep contents to 250cm ³ IGNORE volume of water/solution kept the same
		(ii)	Add (excess) sodium/potassium hydrogen carbonate to the water ✓	1	1 x 3.3b	ALLOW sodium bicarbonate / carbonate solution IGNORE pH probe/CO ₂ probe/lime water test/soda lime
	(b)	(i)	Asexual (reproduction) ✓	1	1.1	ALLOW vegetative / cloning / budding DO NOT ALLOW mitosis
		(ii)	5 ✓	1	3.1a	ALLOW 4
	(c)		Run-off water contains minerals ✓ Increases the growth of the duckweed ✓ (They do not agree) because duckweed is not a submerged plant/floats on the surface so cloudiness/light would not affect photosynthesis ✓	3	3 x 3.2a	ALLOW named mineral/nitrogen compounds IGNORE nutrients IGNORE more/higher yield/biomass of duckweed IGNORE affects growth of duckweed
	(d)		Any one from: Measure the change in mass (during the experiment) Length of stem/root of the plant (during the experiment) ✓	1	3.3a	ALLOW length/height (of plant)

Q25. (June 2024)

C

Q26. (June 2024)

D

Q27. (June 2024)

B

Q28. (June 2024)

B

Q29. (June 2024)

16	(a)		Two / 2 ✓	1	2.1	IGNORE lizard and frog
	(b)		(Idea they are Predators) because they hunt/eat the racers/snake ✓ (Idea they are competitors because) they both feed on lizards / eat the same food ✓	2	2 x 2.1	ALLOW racers are its prey IGNORE predators of snakes/racers ALLOW they are both predators of lizards DO NOT ALLOW both feed on lizards and frogs
	(c)		Egestion and respiration ✓	1	1.1	

Q30. (June 2024)

19	(a)	Host ✓	1	1.1	DO NOT ALLOW more than one circled answer
	(b)	Gains sugars (from the tree/phloem) ✓ Sugar is transported in the phloem ✓	2	2.1 1.1	ALLOW all named sugars ALLOW mistletoe makes less sugar/glucose IGNORE nutrients DO NOT ALLOW minerals/ions ALLOW translocation of sugars in phloem IGNORE minerals
	(c) (i)	(Radioactive) carbon dioxide/carbon is used by the <u>tree</u> in photosynthesis ✓ (The radioactive) carbon/carbon dioxide is trapped/converted/made/turned into sugar/glucose (in the tree)	2	1.1 2.1	DO NOT ALLOW oxygen needed for photosynthesis DO NOT ALLOW references to mistletoe/it/plants using radioactive carbon dioxide/carbon in photosynthesis DO NOT ALLOW references to mistletoe/it/plants using (radioactive) carbon dioxide/carbon to make sugar/glucose
	(ii)	Lower/less chlorophyll/dwarf mistletoe (content) has higher percentage/more of radioactive sugar ✓ Less chlorophyll to produce/make sugar/glucose/photosynthesise ✓ More sugar needed/taken from tree ✓	3	3 x 3.2a	IGNORE simple quoting of data ALLOW ORA AW radioactive carbon/carbon dioxide for sugar ORA for Eastern mistletoe/more chlorophyll ORA for Eastern mistletoe/more chlorophyll IGNORE ATP

Q31. (June 2024)

20	(a)	Lactic acid alters/lowers pH ✓ To measure the speed/rate of decomposition/decay ✓	2	2 x 2.2	ALLOW measure rate/speed of enzyme activity
	(b)	Any three from: Draw a line/scatter graph ✓ Put time on the x axis ✓ Put pH on the y axis ✓ Draw three lines, one for each temperature ✓	3	3 x 2.2	ALLOW sketched graph showing the correct marking points DO NOT ALLOW bar chart/histogram DO NOT ALLOW temperature on either axis ALLOW hrs on x axis ALLOW separate colours/key for each temperature IGNORE line of best fit ALLOW time and pH alone but not stated which axis for max 1 mark if no marks awarded
	(c)	(Increasing the temperature) will increase decay/decomposition ✓ (Increase in temperature) increases the kinetic energy ✓ (increase in temperature) more collisions ✓	3	1 x 2.2 1 x 3.1a 1 x 3.1a	ALLOW (increasing the temperature) will increase conversion of sugar into lactic acid DO NOT ALLOW decay stops at high temperatures ALLOW increase energy to move around / move faster IGNORE more energy ALLOW more enzyme substrate complexes
	(d)	The milk would not decompose / pH would not fall / change ✓ Bacteria would be killed / enzymes denatured / active site changes shape and substrate will not fit ✓	2	2 x 3.3a	ALLOW pH will be 6.5 / sugar can't convert into lactic acid IGNORE slows down decay/pH falls slower

Q32. (June 2025)

B

Q33. (June 2025)

17	(a)	<p>Any two from: Position at random (on the different sections of pitch) ✓</p> <p>Count the number (of dandelions in a quadrat) ✓</p> <p>Repeat/use of several quadrats ✓</p> <p>AND</p> <p>(Mean) = divide (total) number of dandelions by number of quadrats ✓</p>	3	3 × 1.2	<p>ALLOW random number generator / grid references/co-ordinates DO NOT ALLOW transect line IGNORE percentage cover</p> <p>ALLOW take more samples/quadrats</p> <p>ALLOW correct number of quadrats qualified IGNORE references to calculating populations</p>
	(b)	<p>First check the answers in the table If answers = 78.5-79 and 235-237 award 3 marks</p> <p>3.14 or $\pi \times 5^2$ or 25 ✓</p> <p>= 78.5 ✓</p> <p>235.5 ✓</p>	3	3 × 2.2	<p>ALLOW any number in the range of 78.5-79</p> <p>ALLOW any number in the range of 235-237 ALLOW ECF for a correctly calculated total number of dandelions from an incorrectly calculated area</p>
	(c)	<p>Community ✓ Compete ✓ Equally ✓</p>	3	3 × 3.2b	
	(d)	<p>Sample (soil) from each area/around parts of the pitch ✓</p> <p>Test them with (universal) indicator/a pH meter/probe ✓</p>	2	2 × 3.3a	<p>ALLOW pH paper IGNORE litmus paper</p>

Q34. (June 2025)

20	(a)	<p>When it feeds on the (microscopic) plants/producer it is a primary consumer ✓</p> <p>When it feeds on the (microscopic) animals/primary consumer it is a secondary consumer ✓</p>	2	2 × 2.1	<p>ALLOW feeds on (microscopic) plants/producer which is the first trophic level ALLOW when it feeds on (microscopic) plants/producer it's in the second trophic level</p> <p>ALLOW feeds on (microscopic) animals/primary consumer which is the second trophic level ALLOW when it feeds on (microscopic) animals/primary consumer it's in the third trophic level</p> <p>ALLOW it can be a primary or secondary consumer / eats (microscopic) plants/producer and animals/primary consumer for one mark</p>
	(b)	No/less predators / no/less diseases / plenty/more of food available ✓	1	2.1	IGNORE competition unless qualified
	(c)	<p>Less/no light for photosynthesis ✓</p> <p>So less/no growth/food/glucose production ✓</p> <p>AND</p> <p>(Plants) have more minerals ✓ For photosynthesis/respiration/cell division/chlorophyll production/enzyme action/metabolism ✓</p>	1 1 1 1	1.1 2.1 1.1 2.1	<p>ALLOW cloudiness reduces photosynthesis which needs light / cloudiness reduces light for photosynthesis</p> <p>ALLOW minerals are available more IGNORE minerals easier to take up ALLOW form amino acids/cell wall formation/turgor pressure/proteins/protein synthesis ALLOW Can produce more organic molecules so more growth ALLOW AVP</p>

Q35. (Nov 2020)

D

Q36. (Nov 2020)

D

Q37. (Nov 2020)

D

Q38. (Nov 2020)

D

Q39. (Nov 2020)

16	(a)		3	3x1.1	Each correct line = 1 mark DO NOT ALLOW more than 1 line from each letter
	(b)	prevents lake drying out / replenishes lake water / washes minerals into the lake ✓	1	1.1	ALLOW idea of lack of water in lake causing harm to organisms that live in the water / will provide organisms with sufficient/enough water to live in ALLOW idea of providing organisms with dissolved oxygen IGNORE will provide organisms with more water IGNORE nutrients
	(c)	idea that water is added from (each) lake to a (separate) Petri dish using (sterile) pipette ✓ filter paper/antibiotic disc is placed in (the centre of) each dish with the (sterile) forceps ✓ Petri dishes are incubated ✓ idea that the inhibition zone/clear area/area with no bacteria growth around the discs is measured ✓	4	4 x 1.2	 ALLOW idea of repeats ALLOW idea of setting up a control
	(d)	Lake Bellandur– no mark Any two from: more (antibiotic) resistant bacteria / more species of bacteria are resistant to antibiotics / ORA ✓ Lower number of bacteria killed by antibiotics / less species of bacteria killed by antibiotics / ORA ✓ this lake contains a higher ratio of resistant bacteria compared to bacteria killed by antibiotics ✓ (antibiotic) resistant bacteria more likely to survive/reproduce with more (antibiotic) pollution ORA ✓	2	2 x 3.2a	Incorrect or no lake given then no marks ALLOW bacteria are more resistant (antibiotic) DO NOT ALLOW more resistant to bacteria IGNORE immune ALLOW only 28 species are killed ALLOW idea of natural selection causing increased resistant bacteria with more (antibiotic) pollution

Q40. (Nov 2020)

18	(a)	<table><tr><td>bacteria in the compost kill disease causing fungi</td><td></td></tr><tr><td>the compost is sterile and so is aseptic</td><td></td></tr><tr><td>the compost provides carbon dioxide for photosynthesis</td><td></td></tr><tr><td>the compost provides minerals for the plants</td><td>✓</td></tr></table>	bacteria in the compost kill disease causing fungi		the compost is sterile and so is aseptic		the compost provides carbon dioxide for photosynthesis		the compost provides minerals for the plants	✓	1	1.1	more than one box ticked = 0 marks
	bacteria in the compost kill disease causing fungi												
	the compost is sterile and so is aseptic												
	the compost provides carbon dioxide for photosynthesis												
	the compost provides minerals for the plants	✓											
(b)	normal bin has holes to allow in air / oxygen ✓ (making normal compost) so aerobic respiration occurs ✓	2	2.1 1.1	ALLOW converse arguments for bokashi bin ALLOW aerobic bacteria carry out respiration IGNORE bacteria work aerobically									
(c)	used the same pile of dead plant material for both composters / used same plant type / used equal mass in both composters ✓	1	2.2	ALLOW used the same time interval for both composters ALLOW used the same water/moisture content for both composters ALLOW idea of same external conditions e.g. put both in same place / external temperature kept the same / kept in the same environment IGNORE references to fair testing									
(d)	(i) Axes – both correctly labelled, including units✓ Axes - even scales occupying more than half of the grid ✓ Plotting - all points correctly plotted ✓ Line - lines labelled or a key ✓ Line - points with curve of best-fit lines ✓	5	5 x 2.2	Must have time on x-axis and temperature on y-axis ALLOW +/- half a square at least 8 points correctly plotted IGNORE extrapolated lines									
	(ii)	temperature increased as compost decomposed / bacteria released heat by respiration ✓ temperature starts to drop as decomposition slows down/complete / bacterial respiration slows ✓	2	2 x 2.1	ALLOW rise in temperature due to energy released by respiration ✓ ALLOW bacterial activity slows (if respiration already mentioned) ALLOW temperature starts to drop as enzymes in respiration denature at high temperatures								
	(iii)	idea that decomposition in bokashi (method) bin much slower ✓ anaerobic respiration releases less heat/energy than aerobic respiration ✓	2	2 x 2.1									
(e)	(i)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 27 (%) award 3 marks 400 / 1500 x 100 ✓ 26.6 (%) ✓ = 27 (%) ✓	3	 2.2 2.2 1.2	If answer = 26.6 (%) award 2 marks ALLOW ECF for correct rounding								
	(ii)	idea that the gas given off is carbon dioxide ✓ less greenhouse gas produced / less likely to result in global warming / less contribution to greenhouse effect ✓	2	2.2 3.1b	ALLOW for 2 marks less carbon dioxide produced which is a greenhouse gas ALLOW correct formula ALLOW explanations of the greenhouse effect IGNORE references to environmental damage/not environmentally friendly/pollution/not good for the environment								

Q41. (Nov 2021)

B

Q41. (Nov 2021)

A

Q43. (Nov 2021)

A

Q44. (Nov 2021)

B

Q45. (Nov 2021)

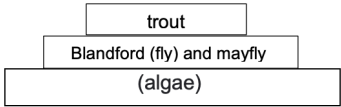
16	(a)		<p><i>Quadrat:</i></p> <p>Sample the plants (in the hedge) ✓</p> <p>Count the number (of different species) in the quadrat ✓</p> <p><i>Key:</i></p> <p>Identify the species of plants ✓</p>	3	3 x 1.2	<p>ALLOW random placement ALLOW idea that the small area is representative of the rest of the hedge</p> <p>ALLOW key to identify species so they can be counted = 2 marks if counted not credited for quadrat</p>
	(b)	(i)	All correct points correctly plotted ✓✓	2	2 x 2.2	<p>ALLOW +/- half a square 0 to 2 correct points plotted = 0 mark 3 or 4 correct points plotted = 1 mark All 5 correct points plotted = 2 marks</p>
		(ii)	Correctly drawn line of best fit ✓	1	2.2	<p>ALLOW best straight line or smooth curve DO NOT ALLOW dot to dot line ALLOW line of best fit for their plotting IGNORE any extrapolation of line DO NOT ALLOW double lines</p>
		(iii)	<p>FIRST CHECK ANSWER ON THE ANSWER LINE If answer = 261 (years) award 2 marks</p> <p>2.1 x 110 + 30 ✓</p> <p>= 261 (years) ✓</p>	2	2 x 2.2	
(iv)	<p>Yes (no mark)</p> <p>As the age of field increases the area of the field decreases ✓</p> <p>D/oldest field has small area and E/newest field has large area /</p> <p>261yr old/oldest field has 1500m² area and 162yr old/newest field has 10 000m² area ✓</p>			2	2 x 3.2b	<p>IF ANSWER IS NO THEN ZERO MARKS</p> <p>ORA</p>

Q46. (Nov 2021)

17	(a)	<table><tr><td>Acid will decrease the pH and cause the enzyme to change shape.</td><td>✓</td></tr><tr><td>Acid will increase the pH and cause the enzyme to change shape.</td><td></td></tr><tr><td>Acid will increase the pH and cause the substrate to change shape.</td><td></td></tr><tr><td>The enzyme will not fit into the active site of the substrate.</td><td></td></tr><tr><td>The substrate will denature</td><td></td></tr><tr><td>The substrate will not fit into the active site of the enzyme.</td><td>✓</td></tr></table>	Acid will decrease the pH and cause the enzyme to change shape.	✓	Acid will increase the pH and cause the enzyme to change shape.		Acid will increase the pH and cause the substrate to change shape.		The enzyme will not fit into the active site of the substrate.		The substrate will denature		The substrate will not fit into the active site of the enzyme.	✓	2	2 x 2.1	More than 2 boxes ticked then each additional incorrect box negates a mark
Acid will decrease the pH and cause the enzyme to change shape.	✓																
Acid will increase the pH and cause the enzyme to change shape.																	
Acid will increase the pH and cause the substrate to change shape.																	
The enzyme will not fit into the active site of the substrate.																	
The substrate will denature																	
The substrate will not fit into the active site of the enzyme.	✓																

(b)	(i)	(Distilled) water ✓	1	2.2	
	(ii)	<p>Yes:</p> <p>Increasing concentrations (of sulfur dioxide) are linked to lower rates of photosynthesis ✓</p> <p>No:</p> <p>Because there is no evidence that it is due to sulfur dioxide being an acid ✓</p>	2	2 x 3.2a	<p>ALLOW sulfur dioxide reduces the rate of photosynthesis</p> <p>IGNORE pH/acid references</p> <p>ALLOW reference to a correlation and not a cause/no causal mechanism</p>
	(iii)	Use different acids ✓	1	3.3b	<p>IGNORE measure the pH to show it is an acid</p> <p>IGNORE repeat experiment with different concentrations of sulphuric acid</p>

Q47. (Nov 2021)

20	(a)	 <p>Shape ✓</p> <p>Labels ✓</p>	2	2 x 2.2	<p>If more than 3 trophic levels are drawn max 1 mark for shape</p>
	(b)	(i)	1	2.1	<p>ALLOW males do not need more protein</p>